DECLARATION of HSUEH S. TUNG

I, Hsueh S. Tung, declare and state that:

1. I am a co-inventor of the subject matter described and claimed in US Patent Application No. 10/620,018 "Methods of Purifying Hydrogen Fluoride".

2. I hold an undergraduate degree in Chemical Engineering from Taipei Institute of Technology (1972) and a PhD in Chemistry from Michigan State University (1981). I have been employed by Honeywell International, Inc., and its predecessor(s) in interest, the assignee(s) of the application, since 1981, holding various positions including Chemist and Senior Project Leader. I am currently a Technical Manager for the Fluorocarbon Process Technology Group. I have extensive experience and familiarity with the development of methods for preparing and purifying anhydrous hydrogen fluoride (HF).

3. I am familiar with the prosecution history of my patent application. I am aware of the Office Action dated March 21, 2007, and understand its contents; including the Examiner's Official Notice that flash distillation and column distillation (or fractionation) are known and conventional steps in the art.

4. I, along with my co-inventor, have found a method for recovering anhydrous hydrogen fluoride from an azeotropic mixture comprising hydrogen fluoride and a halogentated hydrocarbon that involves (a) extracting hydrogen fluoride from the mixture by contacting the mixture with dilute sulfuric acid and then (b) subjecting the extracted hydrogen fluoride to a flash distillation step followed by a column fractionation distillation step.

   One skilled in the art would *not* have known or expected that subjecting a mixture of hydrogen fluoride and dilute sulfuric acid to the *combination* of a flash distillation process followed by a fractionation process would dramatically reduce the amount of sulfur impurities in the process stream. To the contrary, one skilled in the art would have expected that a simple column fractionation alone could be used to recover substantially pure anhydrous hydrogen fluoride from sulfuric acid (i.e., anhydrous hydrogen fluoride having very low sulfur content), just as we expected before our discovery. More particularly, one would expect to see substantially lower sulfur impurities in the distillate of anhydrous HF after a simple fractionation due to the large difference between the normal boiling point of HF (20 ^{o}C) and that of sulfuric acid (338 ^{o}C).

   However, through our extensive experience of actually attempting to separate dilute sulfuric acid from hydrogen fluoride using only column fractionation, we found this not to be the case. That is, instead of low sulfur levels, we found as a

result of our effors that a relatively high level of sulfur impurities remained in the anhydrous HF distillate after column fractionation. After substantial experimentation with different distillation techniques, we carried out a process which demonstrated that flashing the HF and sulfuric acid mixed stream *followed by* fractionation is capable of dramatically decreasing the level of sulfur impurities compared to fractionation alone. This result was unexpected. It is our theory that sulfuric acid decomposes to some unknown sulfur compound having a boiling point less than that of HF, and as a result, this sulfur compound was found in the distillate of anhydrous HF that was processed by column fractionation alone. We believe that flash distillation followed by fractionation minimizes this decomposition.

5. I hereby declare that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true and that any willful false statements may jeopardize the validity of the application or any patent issued thereon.

Hsueh Tung

June 12, 2007
Date

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